DESCRIPTION

Vertically Filling-Packaging Device, and Bag Forming Method Thereof

TECHNICAL FIELD

[0001]

The present invention relates to a vertically filling-packaging device for forming a packaging bag by longitudinally and laterally sealing a film continuously delivered and for filling contents into the packaging bag, and to a bag forming method for the device.

BACKGROUND ART

[0002]

In the prior art, the packaging bag for filling substances to be packaged (or contents) such as a liquid, powder or a viscous substance to seal the contents is generally formed by sealing the packaging film made of a packaging material of either a film of a synthetic resin or a laminate of the film and aluminum film, longitudinally and vertically on the three sides or the four sides. In order to obtain such packaging bag, there is known the vertically filling-packaging device for sealing and packaging the film, which is automatically delivered from a film roll taking up the film in a roll, on

its three or four sides. This vertically filling-packaging device may be required to obtain a packaging bag of a large capacity. In this vertically filling-packaging device, the packaging bag is obtained by sealing the two edges of a folded film or two overlapped films by a longitudinally sealing mechanism to form a cylindrical packaging film, by delivering this packaging film by a film delivering device, by forming a lateral sealed portion for the bottom portion of the packaging film, while moving a portion of the film for one pack downward by a box motion type laterally sealing / (end-sealing) cutting mechanism, and filling the substance to be packaged into the packaging film, and by returning the lateral sealing/cutting mechanism again to an original point position thereby to laterally seal the open side of the packaging film by the laterally sealing/cutting mechanism. At the time of cutting the packaging film, the packaging bag series can be cut separately into the individual packaging bags by activating the cutter when the sealing/cutting mechanism reaches the lower end. The vertically filling-packaging device equipped with that box motion type lateral sealing/cutting mechanism is disclosed in Patent Publication 1, Patent Publication 2 and so on, for example.

Patent Publication 1: JP-A-10-297619;

and

Patent Publication 2: JP-A-10-147304.

[0003]

The box motion type laterally sealing mechanism in such vertically filling-packaging device includes a vertically moving mechanism for moving a pair of a lateral sealers upward and downward, and an opening/closing mechanism for opening/closing the paired lateral sealers. In case the opening/closing mechanism is "closing", the cylindrical film is clamped by the paired lateral sealers, and the vertically moving mechanism is moved downward to form the lateral sealed portion on the cylindrical film. In case the opening/closing mechanism is "opening", the film is opened, and the vertically moving mechanism is moved upward to the action original point.

DISCLOSURE OF THE INVENTION

PROBLEMS THAT THE INVENTION IS TO SOLVE

[0004]

Here in the box motion type laterally sealing mechanism, the opening/closing mechanism and the vertically moving mechanism repeat the "closing" → "downward movement" → "opening" → "upward movement" so that the film is intermittently delivered. Therefore, the laterally sealing mechanism has a problem that it cannot improve the productivity, as compared with the vertically filling-packaging device having a rotary laterally sealing mechanism capable of delivering the film continuously. In the box motion type

laterally sealing mechanism, moreover, the lateral seal is obtained such that the film is clamped under a predetermined pressure by the paired lateral sealers while the opening/closing mechanism is between the "closing" and "opening" states. Since the paired lateral sealers make face contacts, however, a high seal pressure is required between the paired lateral sealers for the satisfactory lateral seals. Anther problem is that the sealing failure easily occurs when the management of the seal pressure fails. In case, moreover, the paired lateral sealer performs the heat seal while extruding the contents such as a liquid being continuously fed, the contents may be bitten by the heat-sealed portion to cause another problem that the heat seal fails.

[0005]

Therefore, the invention has been conceived in view of the problems thus far described, and has an object to provide a vertically filling-packaging device which is excellent in productivity even in case a packaging bag of a large capacity is produced and which can suppress the sealing failures of a laterally sealed portion, and a bag forming method for the device.

MEANS FOR SOLVING THE PROBLEMS

[0006]

In order to solve the aforementioned problems, according

to Claim 1 of the invention, there is provided a vertically filling-packaging device for filling contents, through a filling mechanism, into a packaging bag formed by: forming a film delivered from a film roll into a cylindrical shape; longitudinally sealing the film by a longitudinally sealing mechanism; and laterally sealing the film by a laterally sealing mechanism, characterized by comprising: a rotating mechanism for rotating a pair of heat seal rolls composing the laterally sealing mechanism; and a vertically moving mechanism for moving the heat seal rolls upward and downward.

[0007]

In the vertically filling-packaging device as set forth in Claim 1, according to Claim 2, the downward movement of the heat seal rolls is started from the instant when the film is clamped by seal plates individually attached to the paired heat seal rolls and having a predetermined seal width; and in that the heat seal rolls are moved upward at the instant when the seal plates shift from the clamping state to clamp the film to a non-clamping state, thereby to return the heat seal rolls to an action original point.

[0008]

In the vertically filling-packaging device as set forth in Claim 1, according to Claim 3, moreover, the film is clamped by seal plates individually attached to the paired heat seal rolls and having a predetermined seal width, when the paired

heat seal rolls begin to move downward, and the heat seal rolls are moved upward at the instant when the seal plates shift from the clamping state to clamp the film to a non-clamping state, thereby to return the heat seal rolls to an action original point.

[0009]

In the vertically filling-packaging device as set forth in any of Claims 1 to 3, according to Claim 4, the vertically filling-packaging device further comprises first drive means for rotationally driving the heat seal rolls, second drive means for rotationally driving a delivery screw belonging to the vertically moving mechanism, and control means for electrically controlling the first and second drive means, and the control means controls the first and second drive means so chat the sum of V1 + V2 may be substantially equal to a feeding velocity V of the film, in case the seal plates belonging to the heat seal rolls have a rotating circumferential velocity V1 and in case the heat seal rolls have a downward velocity V2 by the vertically moving mechanism.

[0010]

In the vertically filling-packaging device as set forth in any of Claims 1 to 4, according to Claim 5, the vertically filling-packaging device further comprises a cutting mechanism disposed on the downstream side of the laterally sealing mechanism for cutting a packaging bag series formed

by the laterally sealing mechanism, and the cutting mechanism includes a vertically moving mechanism for the cutting mechanism for moving upward and downward in synchronism with the vertically moving mechanism of the laterally sealing mechanism.

[0011]

In the vertically filling-packaging device as set forth in Claim 5, according to Claim 6, the cutting mechanism cuts the packaging bag series in case the film is clamped by the seal plates belonging to the paired heat seal rolls of the laterally sealing mechanism.

[0012]

In the vertically filling-packaging device as set forth in Claim 5 or 6, according to Claim 7, the cutting mechanism includes an opening/closing mechanism having a pair of film holding plates for clamping the sealed portion of the packaging bag series for opening/closing the film holding plates by third drive means, fourth drive means for moving the cutting mechanism vertically moving mechanism upward and downward, and fifth drive means for activating a cutting member to cut the packaging bag series, and control means for electrically controlling the third, fourth and fifth drive means controls the fourth drive means of the cutting mechanism vertically moving mechanism so that the film holding plates may move downward in synchronism with the downward movement of the

packaging bag series, the third drive means so that the sealed portion of the packaging bag series may be clamped by the paired film holding plates, the fifth control means so that the sealed portion may be cut by the cutting member at a predetermined timing while the sealed portion being held by the film holding plates, and then the third and fourth drive means so that the paired film holding plates may perform the opening action and the upward movement without obstructing the downward action of the packaging bag series having the seal portion to be next cut.

[0013]

In the vertically filling-packaging device as set forth in Claim 7, according to Claim 8, the control means controls the third and fourth drive means in the opening/closing mechanism and the cutting mechanism vertically moving mechanism so that the paired film holding plates may extend along the shape of a packaging bag.

[0014]

In the vertically filling-packaging device as set forth in Claim 1, according to Claim 9, the filling mechanism performs the feeding action of the contents continuously.

[0015]

In the vertically filling-packaging device as set forth in any of Claims 2, 3, 4 and 6, according to Claim 10, the seal plates are formed to have a generally arcuate seal face.

[0016]

In order to solve the aforementioned problems, according to Claim 11, there is provided a bag forming method of a vertically filling-packaging device for filling contents, through a filling mechanism, into a packaging bag formed by forming a film delivered from a film roll into a cylindrical shape, longitudinally sealing the film by a longitudinally sealing mechanism, and laterally sealing the film by a laterally sealing mechanism, and including a rotating mechanism for rotating a pair of heat seal rolls composing the laterally sealing mechanism, and a vertically moving mechanism for moving the heat seal rolls upward and downward, characterized by forming a laterally sealed portion on the film by arranging seal plates formed to have a predetermined seal width at the paired heat seal rolls, by clamping the film being continuously delivered by rotating the paired heat seal rolls, by the seal plates, by moving the seal plates downward together with the film being delivered, and by rotating the seal plates continuously during the downward movement.

[0017]

In a bag forming method of a vertically filling-packaging device as set forth in Claim 11, according to Claim 12, the filling mechanism performs the feeding action of the contents continuously.

[0018]

In a bag forming method of a vertically filling-packaging device as set forth in Claim 11, according to Claim 13, the control means controls the first and second drive means so chat the sum of V1 + V2 may be substantially equal to a feeding velocity V of the film, in case the seal plates belonging to the heat seal rolls have a rotating circumferential velocity V1 and in case the heat seal rolls have a downward velocity V2 by the vertically moving mechanism.

[0019]

In a bag forming method of a vertically filling-packaging device as set forth in any of Claims 11 to 13, according to Claim 14, the vertically filling-packaging device further comprises a cutting mechanism disposed on the downstream side of the laterally sealing mechanism, and the cutting mechanism moves upward and downward in synchronism with the vertically moving mechanism of the laterally sealing mechanism.

[0020]

In a bag forming method of a vertically filling-packaging device as set forth in Claim 14, according to Claim 15, the cutting mechanism cuts the packaging bag series in case the film is clamped by the seal plates belonging to the paired heat seal rolls of the laterally sealing mechanism.

[0021]

In a bag forming method of a vertically filling-packaging device as set forth in Claim 14 or 15, according to Claim 16,

the cutting mechanism includes a pair of film holding plates for clamping a sealed portion of the packaging bag series, and a cutting member for cutting the sealed portion; the film holding plates move downward in synchronism with the downward movement of the packaging bag series; the sealed portion of the packaging bag series is clamped by the paired film holding plates; the sealed portion is cut by the cutting member at a predetermined timing while the sealed portion being held by the film holding plates; and then the paired film holding plates perform the opening action and the upward movement without obstructing the downward action of the packaging bag series having the seal portion to be next cut.

[0022]

In a bag forming method of a vertically filling-packaging device as set forth in Claim 16, according to Claim 17, the paired film holding plates perform the opening action and the upward movement along the shape of the packaging bag.

ADVANTAGES OF THE INVENTION

[0023]

The present invention relates to a vertically filling-packaging device for forming a packaging bag by longitudinally and laterally sealing a film continuously delivered and for filling contents into the packaging bag, and can provide a vertically filling-packaging device which is

excellent in productivity even in case a packaging bag of a large capacity is produced and which can suppress the sealing failures of a laterally sealed portion, and a bag forming method for the device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

[Fig. 1] Fig. 1 is a diagram showing the entire construction of a vertically filling-packaging device of an embodiment of the invention.

[Fig. 2] Fig. 2 is a diagram showing a laterally sealing mechanism of the embodiment.

[Fig. 3] Fig. 3 is a diagram showing a cutting mechanism of the embodiment.

[Fig. 4] Fig. 4 is a block diagram showing the electric construction of the vertically filling-packaging device of the embodiment.

[Fig. 5] Fig. 5 include diagrams showing the action timings of the laterally sealing mechanism and the cutting mechanism of the embodiment.

[Fig. 6] Fig. 6 include diagrams showing the actions of the laterally sealing mechanism and the cutting mechanism of the embodiment.

[Fig. 7] Fig. 7 is a diagram showing the laterally sealing mechanism and the cutting mechanism of the embodiment.

[Fig. 8] Fig. 8 include diagrams showing another embodiment in the cutting mechanism of the invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0025]

An embodiment of the invention is described with reference to the accompanying drawings.

[0026]

Fig. 1 is an entirely schematic diagram of a vertically filling-packaging device for the four-side sealing. This vertically filling-packaging device H is mainly constructed to include a film feeding-guiding mechanism 1, a film bag folding mechanism 2, a longitudinally sealing mechanism 3, a laterally sealing mechanism 4, a filling mechanism 5 and a cutting mechanism 6.

[0027]

The film feeding-guiding mechanism 1 guides a film F from a film roll 7 mounted at the side portion of the (not-shown) frame, into the film bag folding mechanism 2 through a guide roll 1a and a top roll 1b.

[0028]

The film bag folding mechanism 2 is equipped with a turn guide 2a, by which the film F is folded into halves in its longitudinal direction.

[0029]

The longitudinally sealing mechanism 3 obtains the cylindrical bag forming film F by longitudinally sealing the open side and the folded side of the film F, which has been folded into two halves by the film bag folding mechanism 2, with longitudinally sealing units 3b belonging to a pair of longitudinally sealing roll units 3a thereby to form longitudinally sealed portions FH. Here, the longitudinally sealing roll unit 3a is rotationally driven by drive means 3c composed of a servomotor.

[0030]

The laterally sealing mechanism 4 is provided, as shown in Fig. 1 and Fig. 2, with a rotating mechanism 41 for rotating a pair of heat seal roll 41a, and a vertically moving mechanism 42 for moving the heat seal rolls 41a vertically. The rotating mechanism 41 is equipped with seal plates 41b disposed in the longitudinal direction at a plurality of positions of the outer circumferences of the paired heat seal rolls 41a for forming laterally sealed portions FW. The seal plates 41b are heated by the not-shown heating members arranged in the heat seal rolls 41a. One heat seal roll 41a is connected through a gear to the rotating shaft of rotating mechanism drive means 41c composed of a servomotor, and the other heat seal roll 41a is connected through a gear to that one heat seal roll 41a. As the rotating shaft of the rotating mechanism drive means 41c rotates, therefore, the paired heat seal rolls 41a rotate such

that they can be accelerated or decelerated. Moreover, the rotating mechanism 41 is equipped with pressure means 41d, which is composed of an air cylinder, a hydraulic cylinder or the like for applying a predetermined pressure to the film F clamped by the seal plates 41b belonging to the paired heat seal rolls 41a. As a result, one heat seal roll 41a is pressed onto the other heat seal roll 41a.

[0031]

The vertically moving mechanism 42 is equipped with delivery means 42a composed of a delivery screw for moving the paired heat seal rolls 41a vertically. As this delivery means 42a rotates, a nut portion 42b can move up and down. This nut portion 42b is equipped with a mounting unit 42c to be connected to a frame body 41e of the paired heat seal rolls 41a. The rotations are transmitted to the delivery member 42a by vertically moving mechanism drive means 42d composed of a servomotor. A first pulley 42e is mounted on the rotating shaft 42d1 of the vertically moving mechanism drive means 42d, and a second pulley 42f is mounted on the rotating shaft 42a1 of the delivery means 42a. By causing a belt 42g to run between the individual pulleys 42e and 42f, the rotations of the rotating shaft 42d1 of the vertically moving mechanism drive means 42d can be transmitted to the delivery means 42a.

[0032]

The filling mechanism 5 fills the contents, as fed by

the (not-shown) filling pump, through a filling nozzle 5a into a packaging bag P having the longitudinally and laterally sealed portions FH and FW. The packaging bag P has a length of 40 cm and a width of 25 cm, for example, and fills contents of a capacity of 2 liters or more.

[0033]

The cutting mechanism 6 is equipped, as shown in Fig. 1 and Fig. 3, with a film holding-cutting mechanism 61, and a vertically moving mechanism (i.e., a vertically moving mechanism for the cutting mechanism) 62. The film holding-cutting mechanism 61 is equipped with a pair of film holding plates 61a generally having a C-shape. These film holding plates 61a are so mounted on a support plate 61b through mounting portions 61c as can individually move longitudinally back and forth. The drives of the film holding plates 61a are controlled by film clamping drive means 61d (i.e., third drive means) composed of a servomotor, as will be detailed hereinafter. The film holding-cutting mechanism 61 is further equipped at its one film holding plate 61a with a blade (i.e., a cutting member) 61e for cutting a packaging bag series RP into the individual packaging bags P. The blade 61e is arranged over the supporting plate 61b such that it can move, while the packaging bag series RP is being clamped by the paired film holding plates 61a, from the back position of one film holding plate 61a to the cutting position, thereby to cut the packaging

bag series RP. The blade 61e can be moved back and forth under the pneumatic control of a solenoid valve by the drive source of an air cylinder.

[0034]

On the other hand, the vertically moving mechanism 62 is equipped with delivery means 62a composed of a delivery screw for moving the support plate 61b vertically. As the delivery means 62a rotates, a nut portion 62b can move up and down. This nut portion 62b is equipped with a mounting portion 62c for moving the support plate 61b up and down according to the vertical movements of the nut portion 62b. The rotations are transmitted to the delivery member 62a by vertically moving mechanism drive means (i.e., fourth drive means) 62d composed of a servomotor. A first pulley 62e is mounted on the rotating shaft 62d1 of the vertically moving mechanism driving means 62d, and a second pulley 62f is mounted on the rotating shaft 62a1 of the delivery means 62a. The rotations of the rotating shaft 62d1 of the vertically moving mechanism drive means 62d can be transmitted to the delivery means 62a by causing a belt 62g to run between the individual pulleys 62e and 62f.

[0035]

With the individual units thus far described, the vertically filling-packaging device H is constructed: by folding back the film F continuously delivered from the film roll 7, by the film bag folding mechanism 2 into the cylindrical

shape; by longitudinally sealing the two end portions of the film F folded, with the longitudinally sealing mechanism 3 to form the bag forming film F having the longitudinally sealed portions FH; by laterally sealing the bag films with the laterally sealing mechanism 4 to form the laterally sealed portions FW for the bottom portions; by filling contents of a predetermined quantity through the filling mechanism 5 into the bag films having the bottom portions; by laterally sealing the opening sides of the bag forming films F again with the laterally sealing mechanism 4 to form the laterally sealed portions FW thereby to form the packaging bag series RP; and by cutting the packaging bag series RP by the cutting mechanism 6 at the portions forming the laterally sealed portions FW thereby to obtain the individual packaging bags P.

[0036]

Next, the electric configuration of the major portions of the invention is described with reference to Fig. 4. Reference numeral 20 designates control means composed mainly of a microcomputer. This control means 20 is configured to include: a CPU 20a for executing the later-described processing program; a ROM 20b stored with the processing program; a RAM 20c for storing the operation results or the read results temporarily; and an input/output (I/O) interface circuit 20d for connecting the later-detailed input/output units of the individual mechanisms of the vertically filling-packaging

device H. The individual units 20a, 20b, 20c and 20d described above are connected through a bus 20e. Moreover, the control means 20 is provided with nonvolatile storage means 20f for storing a variety of set values, which are set by the later-described setting means, in a rewritable state.

[0037]

With the input/output interface circuit 20d, there are connected as input means: a film delivery state detecting sensor 21 for detecting the rotating state of the top roll 1b composed of the delivery state detecting roller rotated together with the delivery of the film F; a regi-mark detecting sensor 22 for detecting a register mark (as will be called the "regi-mark") M, as shown in Fig. 6, to be printed on the film F; setting means 23 made of touch panels for setting and displaying a variety of set values; and a rotation detecting sensor 24 for detecting the rotating state (or the sealing state) of the sealing plates 41b provided to the heat seal rolls 41a of the laterally sealing mechanism 4. Here, each of the detection sensors 21, 22 and 24 is composed of a transmission type sensor or a proximity sensor. The detection sensor 21 is enabled to detecting the rotating state of the top roll 1b by detecting the presence/absence of a slit formed in the top roll 1b or a detection target member. On the other hand, the detection sensor 24 detects the seal plates 41b arranged on the heat seal rolls 41a of the laterally sealing mechanism 4.

[0038]

With the input/output interface circuit 20d, moreover, there are connected as output means through the (not-shown) individual drivers: the drive means 3c composed of a servomotor for rotating the heat seal roll 3a of the longitudinally sealing mechanism 3; the drive means (i.e., the first drive means) 41c composed of a servomotor for rotating a heat seal roll 4a of the laterally sealing mechanism 4; the vertically moving mechanism driving means (i.e., the second drive means) 42d composed of a servomotor for moving the laterally sealing mechanism 4 up and down; the vertically moving mechanism drive means 62d composed of a servomotor for moving the cutting mechanism 6 up and down; the film clamping drive means 61d composed of a servomotor for moving the paired film holding plates 61a of the cutting mechanism 6 back and forth to shift the film F either from the unclamped state to the clamped state or from the clamped state to the unclamped state; and a solenoid valve 61f acting as the drive source of a cylinder for moving the blade 61e of the cutting mechanism 6 back and forth to change the packaging bag series RP into the individual packaging bags P.

[0039]

Here in the electric configuration thus far described, the control means 20 can also act to control another mechanism electrically. In this case, the controlled devices other than

the aforementioned ones are connected with the input/output interface circuit 20d, but their electric configuration is omitted for simplifying the description.

[0040]

Next, a bag forming method of a bag filling-packaging device A is detailed with reference to Fig. 5 to Fig. 7. Here, the bag forming method to be described in the following is exemplified by the case, in which the longitudinally sealing mechanism 3 is used as the mechanism for letting off the film F to be delivered from the film roll 7. In the bag forming method of this embodiment, moreover, the regi-mark M is formed on the film F so that the formed position of the regi-mark is laterally sealed and cut by the laterally sealing mechanism 4 and the cutting mechanism 6.

[0041]

In response to a detection signal from the detection sensor 22, the control means 20 controls the drive means 3c of the longitudinally sealing mechanism 3 to establish a film feeding velocity V to be set by the setting means 23. The control means 22 decides whether or not the input time period of the detection signal from the detection sensor 22 is inputted for a constant period based on the film feeding velocity V, so that the film F can be fed out at a synchronized velocity by controlling the acceleration/deceleration of the drive means 3c on the basis of the decision result.

[0042]

The control means 20 sets the rotating velocity of the heat seal rolls 41a of the laterally sealing mechanism 4, that is, a rotating circumferential velocity V1 of the heat seal rolls 41a. The control means 20 determines the rotating circumferential velocity V1 of the seal plates 41b of the laterally sealing mechanism 4 from a mechanically structural distance L1 from the arranged position of the regi-mark detection sensor 22 to the laterally sealing position by the laterally sealing mechanism 4, the size (i.e., the length of the packaging bag P in the delivering direction or the forming interval of the regi-mark M) L2 of the packaging bag P, and the film feeding velocity V. In case the downward velocity of the heat seal rolls 41a by the vertically moving mechanism 42 of the laterally sealing mechanism 4 is designated by V2, the rotating circumferential velocity V1 is so set that the sum (V1 + V2) of itself and the downward velocity V2 may be larger than the film feeding velocity V or may not be smaller than the film feeding velocity V. Moreover, the distance L1 is such a parameter as is mechanically structurally predetermined, and the size L2 is a variable set by the setting means 23. Here, the control means 20 decides the validity of the rotating circumferential velocity y1 on the basis of the input coming from the rotation detection sensor 24 for detecting the rotating state of the heat seal rolls 41a of the

laterally sealing mechanism 4, and adjusts the acceleration/deceleration of the drive means 41c on the basis of the decision result.

[0043]

The control means 20 controls the drive means 41c of the heat seal rolls 41a of the laterally sealing mechanism 4 thereby to establish the rotating circumferential velocity V1, which has been calculated by sealing the formed position of the regi-mark M of the film F to be delivered, with the seal plates 41b. Fig. 5(a) shows a drive waveform S1 of the drive means 41c in the rotating mechanism 41 of the laterally sealing mechanism 4, and a constant velocity control time t1 in the drive waveform S1 indicates that the formed area of the regi-mark M of the film F is laterally sealed with the width of the seal plates 41b. For the time t1, as shown in Fig. 6(a), the laterally sealing mechanism 4 shifts the seal plates 41b from a sealing state A to a sealing state C thereby to form the laterally sealed portions FW in the bag forming film F.

[0044]

Here are detailed the seal plates 41b belonging to the heat seal rolls 41a of the laterally sealing mechanism 4. The seal plates 41b are formed to have arcuate seal faces, as shown in Fig. 6(a). The seal plates 41b is enabled by the squeezing action to extrude the contents being fed without interruption through the filling mechanism 5 into the bag forming film F,

from the laterally sealed portions FW of the film F into the bag forming film F which is positioned on the upstream side (i.e., oppositely of the delivering direction of the film F). As a result, the lateral seal can be so made that the laterally sealed portion FW may not bite the aforementioned contents.

[0045]

The control means 20 controls, on the basis of the drive waveform S1, the drive means 41c in the rotating mechanism 41 of the laterally sealing mechanism 4 so that the film (or the bag forming film F) F is laterally sealed (or heat-sealed) by the seal plates 41b arranged on the heat seal rolls 41a, and controls the vertically moving mechanism drive means 42d of the vertically moving mechanism 42 of the laterally sealing mechanism 4, as shown in Fig. 5(b). Fig. 5(b) shows a drive waveform S2 of the vertically moving mechanism drive means 42d of the laterally sealing mechanism 4. The control means 20 starts the downward movement of the vertically moving mechanism 42 earlier than the seal timing by the laterally sealing mechanism 4 (i.e., the timing to clamp the film F with the seal plates 41b), and controls the vertically moving mechanism drive means 42d of the vertically moving mechanism 42 so that the synchronous state may be established before the seal timing (as referred to Fig. 6(a)) by the seal plates 41b. After the end of the laterally seal in the synchronous state (i.e., on and after the sealing state C of Fig. 6(a)), the control means

20 further controls the vertically moving mechanism drive means 42d of the vertically moving mechanism 42 so that the upward moving action of the vertically moving mechanism 42 may be started to return the vertically moving mechanism 42 to the original position. The downward velocity V2 of the vertically moving mechanism 42 is so set that the sum (V1 + V2) of itself and the rotating circumferential velocity V1 of the seal plates 1 may be larger than the film feeding velocity V or may not be smaller than the film feeding velocity Va. Here, the upward velocity V3 of the vertically moving mechanism 42 may be in time for the timing, at which the position to have the next regi-mark M formed is laterally sealed.

[0046]

As described above, the control means 20 controls the individual drive means 41c and 42d of the laterally sealing mechanism 4 so that the sum of the rotating circumferential velocity V1 of the seal plates 41b provided to the heat seal rolls 41a and the downward velocity V2 of the heat seal rolls 41a by the vertically moving mechanism 42 may be substantially equal to the feeding velocity V of the film.

[0047]

Next, the cutting method of the cutting mechanism 6 is described. Here, Fig. 6(b) shows the motions of the cutting mechanism 6 in synchronism with the vertical movements of the sealing mechanism 4. In Fig. 6(b): arrow D indicates the

downward/upward motions of the film holding-cutting mechanism 61; arrow E indicates the opening/closing motions of the paired film holding plates 61a; and arrow F indicates the forward/backward motions of the blade 61e of the film cutting mechanism 61.

[0048]

The control means 20 controls the drive means 61d in the film holding-cutting mechanism 61 of the cutting mechanism 6 in synchronism with the drive waveform S1 of the drive means 41c in the rotating mechanism 41 of the laterally sealing mechanism 4. Fig. 5(c) shows a drive waveform S3 for driving the drive means 61d of the film holding-cutting mechanism 61 in synchronism with the drive waveform S1 of the drive means 41c. In synchronism with the timing (i.e., the seal state A of Fig. 6(a)), at which the film F is clamped by the paired seal plates 41b to start the lateral seal), as indicated by the drive waveform S3 of the drive means 61d, the control means 20 causes the paired film holding plates 61a to close (as indicated by the arrow E of Fig. 6(b)) thereby to clamp the film F. In synchronism with the timing (i.e., the seal state C of Fig. 6(a)), at which the seal plates 41b leave the film F to end the lateral seal), the control means 20 causes the paired film holding plates 61a (as indicated by the arrow E of Fig. 6(b)) thereby to release the film F.

[0049]

In synchronism with the drive waveform S2 of the vertically moving mechanism drive means 42d in the vertically moving mechanism 42 of the laterally sealing mechanism 4, moreover, the control means 20 controls the vertically moving mechanism drive means 62d in the vertically moving mechanism 62 of the cutting mechanism 6. Fig. 5(d) shows a drive waveform S4 for driving the vertically moving mechanism drive means 62d in the vertically moving mechanism 62 of the cutting mechanism 6. In synchronism with the timing, at which the downward movement of the vertically moving mechanism 42 of the laterally sealing mechanism 4 is started, the control means 20 starts (as indicated by the arrow D of Fig. 6(b)) the downward movement of the vertically moving mechanism 62 of the cutting mechanism 6. The control means 20 controls the vertically moving mechanism drive means 62d of the vertically moving mechanism 62 so that the synchronous state may be established before the timing, at which the film F is clamped by the paired film holding plates 61a of the film holding-cutting mechanism 61. A downward velocity V4 at this time is substantially equal to the film feeding velocity Va.

[0050]

The control means 20 activates the blade 61e of the film holding-cutting mechanism 61 while being timed to the action of the film holding plates 61a. Fig. 5(e) shows a drive waveform S5 of the solenoid valve 61f for moving the blade 61e

back and forth. When the bag forming film F is laterally sealed in the sealed state B of Fig. 6(a) by the laterally sealing mechanism 4 and when the film forming bag F is clamped (as referred to the arrow E of Fig. 5(c) and Fig 6(b)) by the paired film holding plates 61a of the film holding-cutting mechanism 61 so that the bag forming film F and the packaging bag series RP are held by the laterally sealing mechanism 4 and the cutting mechanism 6, respectively, the control means 20 activates the solenoid valve 61f to move the blade 61e forward thereby to cut the laterally sealed portion FW of the film F (as indicated by the arrow F of Fig. 6(b)), and then controls the solenoid valve 61f (i.e., a fifth drive means) to move the blade 61e backward (as indicated by the arrow F of Fig. 6(b)). The control means 20 moves the blade 61e forward, while aiming at the general center of the laterally sealed portion FW formed by the seal plates 41b of the laterally sealing mechanism 4, as apparent from the drive waveform S5, thereby to cut the film F. After the packaging bag series RP was cut by the film holding-cutting mechanism 61, the control means 20 starts the upward movement of the vertically moving mechanism 62 and returns the vertically moving mechanism 62 to the original position (as indicated by the arrow D of Fig. 6(b)). The upward velocity V5 at this time may be in time, at the aforementioned original position, for clamping the position to form a next lateral seal by the paired film holding plates 61a.

[0051]

Here, the control means 20 determines the cutting timing on the basis of a mechanically structural distance L3 from the arranged position of the regi-mark detection sensor 22 to the position to be cut by the cutting mechanism 6, the size L2 of the packaging bag P, and the film feeding velocity Va. Moreover, the distance L3 is the parameter which is mechanically structurally predetermined.

[0052]

The vertically filling-packaging device H is enabled to acquire the packaging bag P of a large capacity type by executing the aforementioned processing without interrupting the feed of the film F.

[0053]

Next, another embodiment of the cutting mechanism 6 is described with reference to Fig. 8, but the detailed description of portions similar or corresponding to those of the aforementioned embodiment is omitted by designating them by the common reference numerals. Fig. 8 presents actions of the film holding-cutting mechanism 61 and the vertically moving mechanism 62 in the cutting mechanism 6. It is assumed that the position of the cutting mechanism 6 shown in Fig. 8(a) is the original position. The control means 20: controls the vertically moving mechanism drive means 62d of the vertically moving mechanism 62 so that the paired film holding plates 61a

may move downward according to the downward movement of the packaging bag series RP; controls the film clamping drive means 61d (Fig. 8(a) so that the laterally sealed portion FW (i.e., the sealed portion) of the packaging bag series RP may be clamped by the paired film holding plates 61a; controls (ON) the solenoid valve 61f (Fig. 8(b)) so that the laterally sealed portion FW may be cut generally at its center with the blade 61b at a predetermined timing of the laterally sealed portion FW being clamped by the film holding plates 61a; and then controls the film clamping drive means 61d and the vertically moving mechanism drive means 62d (Fig. 8(c) and Fig. 8(d)) so that the paired film holding plates 61a may act in the opening direction (as will be called the "opening action") and may move upward without obstructing the downward movement of the packaging bag series RP having the laterally sealed portion FW to be next cut. After this, the control means 20 controls the film clamping drive means 61d and the vertically moving mechanism drive means 62d (Fig. 8(e) so that the film holding-cutting mechanism 61 and the vertically moving mechanism 62 may be returned to their respective original positions. In case the delivery velocity of the film F (i.e., the downward velocity of the packaging bag series RP) is high, the paired film holding plates 61d may be moved upward after the end of or during the opening action of the paired film holding plates 61d.

[0054]

In the actions to open and move upward the film holding plates 61a, the control means 20 performs the opening action and the upward moving action along the mode of the packaging bag series RP having the laterally sealed portion FW to be next cut, so that the film holding plates 61a can act along the mode of the packaging bag series RP without any contact with the packaging bag series RP. Therefore, it is possible to shorten the cycle time, for which the control means 20 arrives at the action point from an original point position of the cutting mechanism 6 and then returns to the original point position, thereby to improve the productivity of the vertically filling-packaging device H for attaining the packaging bag P of a large capacity.

[0055]

This vertically filling-packaging device H and its bag forming method comprises the rotating mechanism 41 for rotating the paired heat seal rolls 41a or the laterally sealing mechanism 4, and the vertically moving mechanism 42 for moving the paired heat seal rolls 41a vertically. The seal plates 41b formed to obtain the predetermined seal width are individually arranged on the paired heat seal rolls 41a. The laterally sealed portions FW are formed at the bag forming film F by clamping the film F being continuously delivered by rotating the paired heat seal rolls 41a, between the seal plates

41b, by moving the seal plates 41b downward together with the film F being delivered, and by rotating the seal plates 41b continuously during the downward moving action. As compared with the vertically filling-packaging device equipped with the laterally sealing mechanism of the box motion type of the prior art, the packaging bag P of the large capacity can be obtained while delivering the film F continuously without any interruption. As a result, it is possible to provide the vertically filling-packaging device of excellent productivity for obtaining the large-capacity type packaging bag. Moreover, the laterally sealed portions FW can be formed by using the rotating mechanism 41 of the laterally sealing mechanism 4 at the sealing step accompanied by the squeezing action of the seal plates 41b, thereby to suppress occurrence of the sealing failure of the laterally sealed portions FW.

[0056]

The vertically filling-packaging device further comprises the drive means 41c for rotationally driving the heat seal rolls 41a of the laterally sealing mechanism 4, and the vertically moving mechanism drive means 42d for rotationally driving the delivery screw belonging to the vertically moving mechanism 42 of the laterally sealing mechanism 4. The control means 20 sets the sum (V1 + V2) and the film feeding velocity V substantially equal to each other, in case the seal plates 41b belonging to the heat seal rolls 41a of the longitudinally

sealing mechanism 4 has the rotating circumferential velocity V1 and in case the heat seal rolls 41b of the vertically moving mechanism 42 of the longitudinally sealing mechanism 4 has the downward velocity V2. This setting eliminates disadvantages such as the formation of wrinkles at the time of laterally sealing the film F being continuously delivered, the distortion of the packaging shape, as might otherwise be caused when the film F is pulled, or the dispersion of the cutting position of the cutting mechanism 6 arranged at the latter stage.

[0057]

The vertically filling-packaging device further comprises the cutting mechanism 6 on the downstream side of the laterally sealing mechanism 4, and this cutting mechanism 6 is provided with the vertically moving mechanism 62 for moving up and down in synchronism with the vertically moving mechanism 42 of the laterally sealing mechanism 4. The cutting mechanism 6 is controlled to cut the packaging bag series RP in case the film F is clamped by the seal plates 41b belonging to the paired heat seal rolls 41a of the laterally sealing mechanism 4. In the case of cutting the packaging bag series RP of a large capacity, the pulsations at the cutting time can be suppressed to ensure a satisfactory cutting.

[0058]

Moreover, the seal faces of the seal plates 41b belonging to the laterally sealing mechanism 4 are made arcuate so that

the contents can be extruded into the bag forming film F positioned below, by the squeezing actions of the paired seal plates 41b even in case the contents exist at the position to form the laterally sealed portions FW when these laterally sealed portions are to be formed. It is possible to obtain the laterally sealed portions FW of a satisfactory appearance without any bite of the contents by the laterally sealed portions FW.

[0059]

Since the feeding action of the contents by the filling mechanism 5 can be continuously made, the intermittent filling actions of the filling pump for feeding the contents can be eliminated to improve the productivity of the vertically filling-packaging device for obtaining the packaging bag of the large capacity type.

[0060]

Moreover, the cutting mechanism 6 causes the film holding plates 61a to perform the opening actions and the upward moving actions of the film holding plates 61a along the shape of the packaging bag series RP having the laterally sealed portions FW to be cut next, so that the film clamping plates 61a can be moved along the shape of the packaging bag series RP without any contact with the packaging bag series RP. It is, therefore, possible to shorten the cycle time of the cutting mechanism 6 thereby to improve the productivity of the vertically

filling-packaging device H for obtaining the packaging bag P of the large capacity.

[0061]

In the embodiment of the invention, the respective vertically moving mechanisms 42 and 62 of the laterally sealing mechanism 4 and the cutting mechanism 5 are so constructed as to be driven independently of each other. However, the invention may also use a cam mechanism for acting in synchronism with the vertical movements of the laterally sealing mechanism 4.

[0062]

After the paired heat seal rolls 41a started to move downward, according to the embodiment of the invention, the film F is clamped by the seal plates 41b individually belonging to the paired heat seal rolls 41a and having the predetermined seal width, and the heat seal rolls 41a are moved upward at the instant when the seal plates 41b shift from the clamping state to clamp the film F to the non-clamping state, thereby to return to their original points. In the invention, however, the downward actions of the heat seal rolls 41a may be started from the instant when the film F is clamped by the seal plates 41b individually belonging to the paired heat seal rolls 41a, and the heat seal rolls 41a may be moved upward at the instant when the seal plates 41b shift from the clamping state to clamp the film F to the non-clamping state thereby to return the heat

seal rolls 41a to the action original point.

[0063]

Moreover, the embodiment of the invention is exemplified by the case, in which the film F having the regi-mark M formed is used to form the laterally sealed portion FW at the position having the regi-mark M formed, but can also be applied to the case using the film F having no regi-mark M. In the control method of the laterally sealing mechanism 4 of this case, the rotating circumferential velocity V1 of the seal plates 41b is determined on the basis of the film feeding velocity V, the size L2 of the packaging bag and the spacing between the plural seal plates 41b arranged to the heat seal rolls 41b, and the rotations of the heat seal rolls 41a are controlled with reference to the detection signal coming from the rotation detection sensor 24 for detecting the rotating states of the seal plates 41b of the laterally sealing mechanism 4. In the method for controlling the cutting mechanism 6, on the other hand, the cutting timing of the cutting mechanism 6 is determined on the basis of the film feeding velocity V, the size L2 of the packaging bag, and the mechanically structural distance from the laterally sealing position by the laterally sealing mechanism 4 to the cutting position by the cutting mechanism 6, so that the film holding-cutting mechanism 61 in the cutting mechanism 6 is controlled with reference to the detection signal coming from the rotation detection sensor 24

for detecting the rotating state of the seal plates 41b of the laterally sealing mechanism 4. In the control method of the vertically moving mechanism 62 of the cutting mechanism 6, on the other hand, the control is synchronized with the vertically moving mechanism 42 of the laterally sealing mechanism 4.

INDUSTRIAL APPLICABILITY

[0064]

The present invention can be applied to the vertically filling-packaging device for three-side sealing or the four-side sealing, and to the vertically filling-packaging device for forming a cylindrical bag by folding one film sheet into halves, by overlaying two film sheets, or through a sailor's plate.